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**DESIGNATION OF VARIABLE STARS.**

BY **SIDNEY D. TOWNLEY.**

One cannot but wonder at the lack of foresight displayed by the eminent astronomers who suggested and used various systems of designating variable stars. ARGELANDER's system of using the last letters of the alphabet, beginning with *R*, provides for only nine variables in each constellation, and he apparently had no idea, at first, that this number would ever be exceeded. The systems of CHANDLER and of PICKERING are both based on the coördinates of the star for 1900 and it does not seem to have occurred to either of these astronomers that our successors of the twenty-first and following centuries might not find it either inspiring or convenient to work out designations of new variables for the epoch of 1900. One argument in favor of PICKERING's system was that the number designating the variable gives the right ascension of the star to the nearest minute of time and the declination to the nearest degree. What use will these numbers be in the year 11,900 for example?

In order that we may discuss this subject more intelligently I wish to present in some detail, altho as briefly as possible, the various systems which have been proposed. The first variables discovered were bright stars, hence already had designations, and the necessity for a separate nomenclature was not apparent.

The first catalog of variable stars was published by PIGOTT in the *Philosophical Transactions* for 1786. This list contained twelve stars recognized as certainly variable and 38 others suspected of variability. Four of the twelve variables were *Novæ*. No other catalog appeared until 1844, when two were

published, one by SMYTH and the other by ARGELANDER. There were 18 stars in ARGELANDER'S "Täfelchen," as he called it, and eight of these were without special designation.

In ARGELANDER'S second catalog, published in 1850 in HUMBOLDT'S *Kosmos*, 24 variables were listed and ARGELANDER'S now well known nomenclature, *R*, *S*, *T*, etc., was used for the first time. He did not include *Novæ* under the head of variable stars. ARGELANDER'S nomenclature was followed by SCHÖNFELD and, with extensions, by most, if not all, other compilers of catalogs in more recent times.

The limitations of the Argelander nomenclature were early recognized, for CHAMBERS wrote as far back as 1865, "The time seems arriving when it will be imperatively necessary to adopt a new nomenclature for variable stars. The present system, besides being inartistic, is gradually, and not very slowly either, drawing to a natural termination; indeed in one constellation—*Virgo*—but two letters remain unappropriated."<sup>1</sup>

At the meeting of the Astronomische Gesellschaft held in Strassburg in 1881, HARTWIG proposed using the double letters, *RR*, *RS*, etc. This would give 45 additional symbols, the combinations of nine letters taken two at a time, plus the nine combinations, *RR*, *SS*, etc., or a total of 54 symbols for each constellation. This suggestion was adopted and first used in 1888, both by CHANDLER in his first catalog of variable stars and also by SCHÖNFELD in the ephemerides for 1889.

The device proved to be sufficient until about 1904, when a further extension became necessary. This time combinations of the first letters of the alphabet, *AA*, *AB*, etc., were employed. Leaving out the letter *J*, we find that this device adds 280 new symbols and these have proved ample up to the present time. The greatest number of variables are found in the constellation *Orion*, 32 of the 280 new symbols having already been used in this constellation.

It is evident, however, that even these symbols may become exhausted in a comparatively short time. What shall we do then? Shall we devise a third extension to the Argelander system or shall we break away from it entirely and adopt a new system? Many suggestions have been made, but before taking these up it might be worth while to note that the first

<sup>1</sup> *Monthly Notices*, R. A. S. **25**, 66, 1865.

and second extensions of the Argelander system have never been adopted by the French. Ephemerides of variable stars were published in the *Annuaire* from 1877 to 1910, and after the first nine Argelander letters had been exhausted then these same letters with exponents were used,  $R^2$  for  $RR$ ,  $S^2$  for  $RS$ , etc., up to  $Z^6$  for the first extension of the Argelander system and up to  $R^{38}$  for the second extension. This system is surely cumbersome.

There are, I believe, three fundamental requirements that must be met in any system of variable star nomenclature which can hope for universal adoption. These are:

First—It must be simple.

Second—It must be capable of indefinite extension.

Third—It must not depend upon any particular epoch of time.

The Argelander system does not fulfill either of the first two requirements and is open to the further objection that it has not been made all-inclusive, such variables as *Algol*, *o Ceti*, *Polaris*, etc., never having been given symbols in the Argelander system.

The system of the *Annuaire* is surely not simple, and as the *Annuaire* no longer publishes ephemerides of variable stars, we need not perhaps give further consideration to this system.

The systems of CHANDLER and of PICKERING depend upon the epoch of 1900 and hence cannot fulfill the third requirement. There are other objections to them but we need not stop to consider them, as neither system is now being considered for universal adoption.

So much for the four systems which have been in actual use. If we grant that the three fundamental requirements mentioned above are reasonable and desirable, then it is evident that no system dependent upon letters can be satisfactory, for no such system is capable of indefinite extension. A system composed of a combination of letters and numbers, as exponents, subscripts or otherwise, is capable of indefinite extension, but is not simple.

My own suggestion would follow that made by CHAMBERS and also by ANDRÉ many years ago.<sup>1</sup> In 1865 CHAMBERS wrote, in publishing his second catalog of variable stars, as

<sup>1</sup> *Monthly Notices*, R. A. S. 25, 208, 1865.

follows: "ARGELANDER's nomenclature has been followed, but it is manifest that it is a very crude and unsatisfactory one, and at no very distant period will have to give place to something more artistic. Perhaps, on the whole, simple cardinal numbers, representing the order of discovery, with the syllable 'var.' and the name of the constellation appended, would be the most convenient and manageable system; e. g. 154 var. *Andromedæ*."

I would suggest that the letter "v" be used in place of the syllable "var," and that the letter be placed before the number thus: v 154 *Andromedæ*. I would suggest that all variables be brought under this system; e. g. *Algol* = v 1 *Persei*, SS *Cygni* = v 20 *Cygni*, etc. If the suggested system be adopted it would be necessary, of course, at least in the first catalog issued, to print the old designation as well as the new, but after the present generation of astronomers has passed away such duplication of nomenclature would no longer be necessary.

It is readily seen that the proposed system satisfies the three requirements laid down. First, it is simple. Nothing could be simpler unless we leave off the letter "v," but this might cause confusion with the Flamsteed numbers. Second, the system can be extended indefinitely. Third, the system does not depend upon any particular epoch of time. I would suggest that the clusters and the Magellanic Clouds be considered as constellations, and that the variables in these be numbered separately from other variables of the constellations to which they belong. The letter "v" is the initial letter for the word variable in all the principal European languages—English, French, German, Italian, Spanish, Dutch, and perhaps others.

I had decided to make this suggestion before looking up the history of the subject. I do not mention this with the idea of trying to claim any credit whatever for the suggestion, but simply as an additional argument in favor of the plan. Any plan independently worked out by several persons must, I believe, have some merit to it.

Since above was written I have found that NIJLAND also independently made almost an identical suggestion, first in 1913,<sup>1</sup> and then repeated and actually used it in 1914.<sup>2</sup>

<sup>1</sup> *Hemel en Dampkring*, 10, 177, 1913.

<sup>2</sup> *A. N.* 190, 209, 1915.

This second suggestion by NIJLAND brought forth a protest from HARTWIG,<sup>3</sup> who is in favor of retaining the Argelander system even to the extent of using the letters of the alphabet in combinations of three, which would add 2325 symbols. HARTWIG states two main objections to the proposed nomenclature, but neither, in my opinion, is very serious. The first objection is that the new designation would in all cases be longer than that of ARGELANDER. For instance *R Aurigæ* would become *v 1 Aurigæ*, a single letter being replaced by a letter and a figure; *SS Cygni* would become *v 20 Cygni*, two letters being replaced by one letter and two figures. HARTWIG's second objection is that the new nomenclature might lead to confusion in recording or interpreting, observations made by the Argelander method. For instance a variable *R* is observed and the result is *a3R3b* or *a3Rb*. In the new system this would be *a3v13b* or *a3v1b*. In the first case there would be an uncertainty as to whether *v 1* is three steps brighter than *b* or *v 13* is equal to *b*, and in the second case, whether *v 1* equals *b* or *v*, the number designation having been omitted, is one step brighter than *b*. Now HARTWIG makes no mention of the constellation to which this supposed variable *R* or *v 1* belongs, but in order that the observation may be complete this must be given and if we put the constellation in the record of the observation then there is no more ambiguity in the new system than in the old, thus, *a3v1 Aurigæ 3b*.

My own practice in recording observations by the Argelander method has been somewhat different and no uncertainty or ambiguity arises, no matter what system of nomenclature is used. I always write the name of the star first and then use simply the letter *v* in the observation, thus, in the old system, *R Aurigæ*, *a3v3b* or *a3vb*; in the new system, *v 1 Aurigæ*, *a3v3b* or *a3vb*. If this method of recording observations be used, and it seems to me both simple and logical, then HARTWIG's second objection has no force whatever.

STANFORD UNIVERSITY,  
July 31, 1915.

<sup>3</sup> *Vierj. der Ast. Gesell.*, 40, 261, 1914.